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I.B.F. Vol. 39

If anybody took the trouble to compare the first, tenth and twentieth volumes of the Proceedings of the Institute of British Foundrymen, they would have presented to them a picture, not as they would imagine of gradual progress, but one of dynamic change. The first volume was nothing much more than a theatre programme in size, yet in a way it disclosed what the future held. Very early there were pleas for the increased use of the microscope, which was quickly followed by a demand for more papers of a practical nature. Throughout the long history of the Institute there has been maintained an excellent compromise which has resulted in the presentation of technological papers.

Volume 39, which has just arrived, very faithfully reports opinion on those matters, which are to-day exercising the minds of those controlling the industry. The gaseous annealing of malleable, foundry training, ethyl silicate and test-bars are amongst the subjects exercising the minds of the leaders of thought within the industry. Then for the first time in history a Russian technologist, Professor Shestopal, has a contribution on design in relation to production problems. Apart from the test-bar paper by Mr. Frank Hudson, this particular volume is rather weak in purely non-ferrous foundry practice. This is no fault of either the Editor or the Committee, but is solely due to the non-ferrous industry itself. This does not mean that there is little of interest to the non-ferrous foundry, for underlying all the papers there is the production of castings and much is basic to all metals. One must expect perhaps for a year or two technological reports of the war effort. These are essential as being unvarnished descriptions of the efforts made by our industry towards ultimate victory. The contributions by Mr. Basil Gray and Mr. Bull and Mr. Peers are historical documents of real wealth. Certainly this volume is a veritable text book on cupola practice, with outstanding contributions from Mr. E. Longden, Mr. Taft, and Mr. Hallett, and Mr. D. H. Young. So, too, the malleable section is well covered as no fewer than four papers are included. The ninth Edward Williams Lecture by Sir Claude D. Gibb more than maintained the the extraordinary high standard we have come to expect. A better balanced paper on castings and weldings has never been presented to any institute.

The growth of the Institute has been astonishing and this is not without effect on the Proceedings. Few members realise that had the previous membership not increased, a larger volume could have been made. Such is the finality of success! However, with the diminished space at his disposal, the Editor, Mr. John Bolton, has prepared a volume which is a credit to the Institute.

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New British Standards

The British Standards Institution, of 28, Victoria Street, London, S.W.1, have just issued their March information sheet. Under "New Standards Issued" are:—

Impact Test for Cast Iron (2s. 1349:1947).

The test covered by this specification has been developed as a result of research work undertaken during the war years to determine the shock resistance of grey cast iron. The specification lays down the dimensions of the test-piece which has been found most satisfactory for cast iron, and gives details of the modifications to the grips in the 120 ft.-lb. pendulum type machine which is used for the test. Details of the testing points to be checked on the machine before the test is carried out and the testing procedure are also included.

Colours for Vitreous Enamel Finishes (2s. 1358:1947).

This card provides for 14 colours for vitreous enamels which have been produced through the co-operation of the British Colour Council and the Institute of Vitreous Enamellers. In addition to giving colour specimens the card also gives the colorimetric values for each colour based on the International system of colour specification. The percentage brightness factor is also given.

Amongst standards circulated for comment there is CH 9110 on the finish of cast iron baths in vitreous enamel—dry process (porcelain enamel).

Castings will hold up Cars

Castings are likely to be the next serious bottleneck in holding back increased automobile production in the United States, once the steel bottleneck is broken. The average automobile contains 615 lb. of grey iron castings and 76 lb. of malleable castings. Automobile industry spokesmen say that most of the 5,000 foundries in the United States claim they are operating in or near capacity. If this is true, it appears to automobile manufacturers that foundries unable to produce sufficient castings to meet the demand for 5,000,000 to 6,000,000 automobiles yearly. Automobile manufacturers are urging foundry owners to clean up, redesign and mechanise their foundries so that "better workmen will be attracted."

Foundry Statistics

The weekly average deliveries of steel castings for the month of March picked up to 2,900 tons. This figure compares with 2,200 tons for February and 2,900 for 1946. Employment in ironfoundries continues to grow but obviously for the week ending February 8, the monthly increment was not of the normal 2,000 a month. Actually it rose by 1,155 to reach a total of 134,032, as compared with 107,362 a year ago. For the first time for many months there has been a gain instead of a loss in women power—132 have joined the industry during the month.

Foundry Coke Merchants' Association

Annual Luncheon

The annual luncheon of the Foundry Coke Merchants' Association—followed by the annual meeting, which was held in private—was held at the Waldorf Hotel, London, on May 22. The chair was taken by Mr. Arnold Carr. (chairman of the Association).

The CHAIRMAN, responding to the toast of "The Foundry Trade Merchants' Association," proposed by Mr. R. H. Grierson, expressed satisfaction at the presence of so many coke producers. Remarking that the Association was now entering its sixth year, he said they had a constitution that had been devised and adopted in conjunction with the manufacturers and consumers of coke and he was satisfied that this constitution served the best interests of both sides. The manufacturers had helped the Association very considerably during its probationary stage, but he thought it could now be said that the Association had established itself as a working body and that the manufacturers and consumers could negotiate with it as an association representing the merchant side and could accept decisions made by it on behalf of the trade. He believed that the total output of foundry coke in this country was about one million tons and the Association was responsible for the sale of approximately 75 per cent. of that quantity. Therefore, they could claim to perform valuable service to the trade, both from the producing angle and from that of the consumer. There were a large number of foundries in the British Isles and they all had peculiarities which the merchants had to deal with and provide for. That, however, was their job and they were very happy to take that responsibility off the shoulders of the producers.

MR. J. J. SELBY, who proposed "The Visitors," gave them a cordial welcome and coupled the name of Mr. J. Y. Feggetter with the toast, at the same time extending hearty congratulations to him on his recent appointment as Northern Divisional Marketing Officer of the National Coal Board.

MR. J. Y. FEGGETTER, in reply, expressed his appreciation of the hospitality extended to the visitors. As regards the future, he was only too pleased that this luncheon was being held that day and not in a fortnight's time, because the fresh allocations would be announced in a few days and he anticipated there would be some disquietude when they were received by the various merchants concerned. However, the great thing to-day, when there were so many changes taking place, was that they should not lose their equanimity, by which he did not mean they should be complacent. In the National Coal Board, which some people, he believed, had described as organised chaos, they tried to retain their equanimity and, if they worked together in that spirit, the results should be satisfactory to everybody.

Some Moulding Problems and their Solutions*

By S. Jane

The first casting dealt with consisted of a frame some 9 ft. square and curved on the base to fit snugly on to a shell 13 ft. 6 in. diameter (Fig. 1). At each end were two flanges parallel to each other but in two different planes about 28 in. apart. These ends, being curved, added to the peculiar shape of the frame; the sides, being of a channel section only 6 in. deep overall, were parallel and straight. The thickness of metal was of a fairly consistent 1¼ in. thickness all over, except for the ribs which varied from 1 in. to 1¾ in. The large surface area of the frame at the lower end should be noted. It is clearly shown on half elevation "A." This face must be free from scabs or warping which would prevent the frame from fitting snugly on the shell. The estimated weight of the frame was 2½ tons.

The box parts needed to be 12 ft. square and 30 in. in depth and weighed about 3½ tons for each part and when rammed with sand would probably be 20 tons.

These weights are quite obviously beyond the 10-ton limit of the cranes and box parts of these dimensions were not available.

The problem, therefore, resolved itself into the following conditions:—

(1) The weight of the casting was quite within the melting capacity of the furnaces and could be easily handled by the cranes, etc., that is, taking it from a casting point of view.
(2) Box parts of a suitable size were not available, and if they were available, they could not be lifted or rolled over with safety when rammed with sand.
(3) This, therefore, entailed an unorthodox method of moulding.

The last point in turn raised a further very important consideration, that was the experience of the moulders who were available. This is often overlooked in the smaller foundries when quoting or taking on work of unusual character, where the experienced moulder is not at hand for the actual moulding. A graver responsibility must fall on the foreman, for he must choose keen men with a will to learn, and he must lead them. This, however, is only "a next best thing" to the experienced man, and affects the time factor and also the risks on the job.

Method Used

After due consideration, it was decided to bed the mould in the floor and to cover it with cores, using weights to prevent the cores from lifting whilst casting.

*Extracted from a Paper read before the South African Branch of the Institute of British Foundrymen, Mr. J. H. West presiding.

A full pattern was made with a corebox to take out the channel section on the sides. The top flanges on the ends were left loose so that draw-backs could be utilised instead of making many coreboxes for the varying sections on these ends.

It will be obvious that a pattern of these dimensions could not be made rigid enough to prevent warping or twisting while ramming. To overcome this a braced frame was made with the 13 ft. 6 in. diameter curve on top. The coreboxes to cover the top were

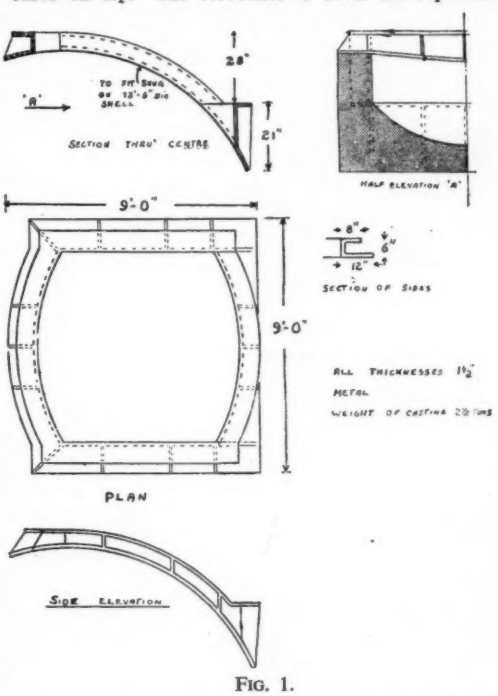


FIG. 1.

made in convenient sections and to suit the varying contour of the top flange of the casting and the position of the risers marked (Fig. 2).

In the larger foundries there is usually a pit with special appliances for work of a bedding-in nature. However, as no such convenience existed resort was had to the old practice of digging a pit in the foundry floor, the dimensions of the pit being 16 ft. long, 14 ft. wide and some 3 ft. in depth.

In this pit the braced frame was placed and trued up to avoid any winding or warping and the mould

Moulding Problems

proper was now started by ramming the sides and the ends around the frame using a straight-edge over the frame to strike a true curved bed. The frame was now removed and the space occupied by the frame rammed it. The inside of the frame was not rammed with sand so as to facilitate ramming in the runner to all four sides of the frame.

The curved bottom of the mould having been struck-up, the pattern was placed in position, care being taken to ensure that it was true to the centre lines.

The bottom joints for the drawbacks were now cut and the drawbacks themselves proceeded with, each end being divided into suitable division for the drawbacks. Each drawback, including the supporting grid at the deep end, weighed about 5 cwt. Here again the experience of the moulder comes into play. To what extent could he safely use coke or ash to lighten this weight? How much clearance must he leave between joints so that these heavy drawbacks will return to their correct positions after drying?

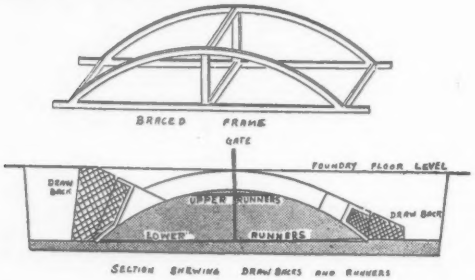


FIG. 2.

Runners

The runners, which were built up with fireclay sleeves, were designed to run the casting on two elevations at both sides and ends, the lower elevation connected with the casting at the bottom of both ends, each end having three widely separated sprays. In the upper elevation, the runners connect the casting on each of the two sides, also using three widely separated sprays, these all being connected to one central down gate located in the centre of the mould (Fig. 3).

The drawbacks were now lifted away from the mould with the aid of a crane, lifting eyes having been incorporated in the grid with a view to keeping the drawback in balance, which were now finished off and taken to the drying stoves. The pattern was now drawn and the bottom of the mould nailed and finished, fire buckets being placed in the mould to dry it. Covering cores in the meantime were made in the core boxes provided for that purpose.

When the mould was thoroughly dried, the drawbacks were replaced using chaplets to support them where necessary. The side and covering cores were now placed in position and the whole weighted and rammed.

A few minutes after the job was cast, the inside of the mould was broken and the runners cut to ease the contraction and so another foundry problem was solved.

The usual practice of using brick compo for heavy work was replaced by a synthetic sand, as this type of sand has the advantage of rapid drying and cleaner stripping from the casting. The advantage of the sand which dries rapidly for a mould bedded in the floor is obvious. This job could have been successfully cast with only air-drying, but, however, that was a risk a little too great to take.

Truck Wheels

The next moulding problem is an everyday truck wheel which would normally present no difficulty for

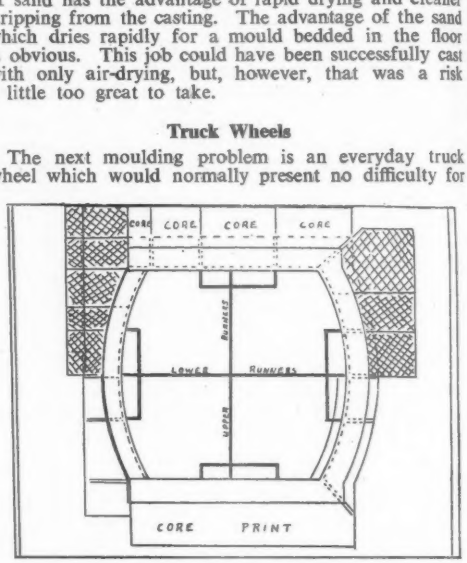


FIG. 3.

machine moulding, but the draughtsmen saw fit to attach 3 lugs to the bottom of the boss on which to bolt a cap (Fig. 4). This job must be considered from a mass production point of view. Therefore, the lugs must be drawn in or alternately provision made for a core under each lug.

To consider the second option first, it would mean that three extra cores would have to be made for each mould. If 100 moulds per day were moulded it would mean 400 cores to be made and placed in the mould plus all the other minor inconveniences that cores bring with them. If the lugs were to be drawn in they must necessarily be left loose on the pattern and drawn by hand; other disadvantages being that the lugs are bumped by the machine into all manner of positions, some up and some down. Further, why must a slow and unsatisfactory hand method of "drawing-in" be used on a mechanical machine? Could not some device more in keeping with such a machine be constructed?

Although the foundry did not possess a well equipped machine shop to machine parts for a

mechanical arrangement, it was decided to give it a chance. An aluminium pattern for the wheel was cast and at the lower end of the boss a plate the thickness of the lugs was incorporated. Into this plate three slots were located to suit the width of the lugs, the inside of the boss being turned.

Now a cam plate on a central spindle and three $\frac{1}{4}$ in. wide cam slots was also cast in aluminium. Three lugs correctly shaped with a $\frac{7}{16}$ in. dia. pin located in the correct position were now made. The whole was now assembled, the print for the centre core was mounted into a steel plate $\frac{3}{32}$ in. thick. This plate in turn was fastened to the boss by three screws, this plate also being the means of holding the three lugs from falling out of position. A filling piece made of timber was fitted inside the boss to prevent the cam plate from falling out of position.

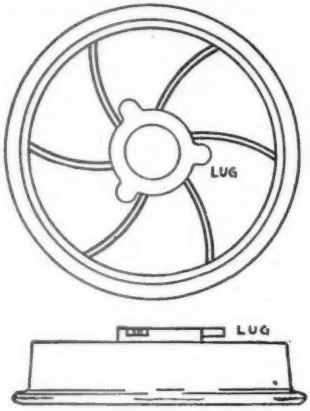


FIG. 4.

The whole was now mounted on a pattern plate, provision being made in the plate for an operating lever or a wheel operated by a rope, which, in turn, turned the cam plate causing the lugs to move in and out as desired. In spite of being crudely constructed many thousands of wheels were turned out; the maintenance was slight considering the conditions under which such a contraption must work. At a later date brass working parts were substituted for aluminium which improved matters still further.

A distinct advantage in speed of production over both other options was found, and, further, the lugs were always in the correct position, the only disadvantage being that it was necessary to pack sand under the lugs by hand to present the sand from "bumping-down" under the lugs. A progressive moulder once attempted to bump the mould with the lugs in the closed position and then force the lugs out to overcome this disadvantage, but it was rather a hopeless failure owing to sand getting into the boss and jamming the works. However, had the idea worked, it would have been a great improvement all round.

Tank Spares

In 1942 or thereabouts, a staff officer asked the foundry to undertake the manufacture of spares for tanks. These castings were extremely difficult due to their shape, thickness of metal and fine casting tolerances allowed. The one chosen gave a great deal of trouble.

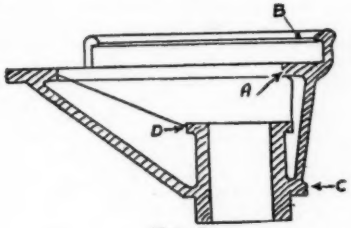


FIG. 5.

It was roughly of a conical shape which had been pushed over at the apex so as to give an eccentric action when turned (Figs. 5 and 6). The inside boss had a rim (D) on it which would not allow a "free draw," this boss being connected with the body by eight stiffening ribs. Further, there was a boxed section

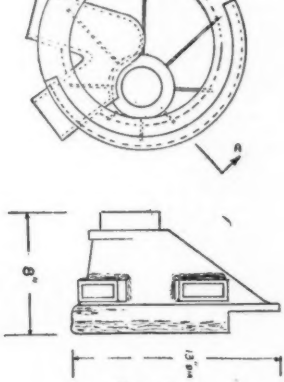


FIG. 6.

in the form of a V projecting outside the main body and connecting with the boss on the inside.

It will be noticed that at the top of the inside of the cone was a rim (A) while beyond that was another rim (B) for half of the diameter. At the apex of the cone will be seen another projecting rim (C) also for half of the diameter. The overall dimensions were approximately 13 in. diameter and

(*Continued on page* 118.)

D

Mechanical Engineering Research

The Government, through the Department of Scientific and Industrial Research, is setting up a special organisation to carry out scientific research in Mechanical Engineering to meet and anticipate the needs of industry. The eventual annual expenditure will be in the region of £250,000 to £350,000, although it is unlikely that this figure can be reached for some years because of the present difficulties in obtaining suitably qualified staff and buildings. The research is intended mainly to supplement the research carried on in other research organisations in this country and will largely be confined to those fundamental problems which underlie all mechanical engineering. Subjects in which research is expected to take place are:—(*a*) Properties and strength of materials; (*b*) mechanics of solids, stress, stability and vibration of structures; (*c*) mechanics of fluids; aerodynamics, gas dynamics and hydraulics in their mechanical engineering applications; (*d*) lubrication, wear and mechanical engineering aspects of corrosion; (*e*) mechanisms, engineering metrology, and noise control; (*f*) mechanics of formation of materials; machine shaping of materials, and (*g*) heat transfer, heat exchange apparatus and applied thermodynamics.

For the time being much of the work will be carried out at the National Physical Laboratory.

Research Director Appointed

Dr. G. A. Hankins, D.Sc., M.I.C.E., M.I.Mech.E., Superintendent of the Engineering Division of the National Physical Laboratory, D.S.I.R., has been appointed Director of Mechanical Engineering Research. As with all other research organisations in the D.S.I.R., the Director will be advised by a Board, consisting of eminent scientists, technicians and industrialists, serving in their personal capacity and not as representatives of any organisation to which they may belong. The composition of the Mechanical Engineering Research Board, which had its first meeting on May 22, is as follows:—Dr. H. L. Guy, C.B.E., F.R.S., Chairman. Mr. L. Akehurst, Operative, London Passenger Transport Board. Professor R. N. Arnold, D.Sc., Ph.D., Professor of Engineering, University of Edinburgh. Dr. F. S. Dorey, C.B.E., D.Sc., Chief Engineer Surveyor, Lloyd's Register of Shipping. Sir Claude Gibb, C.B.E., F.R.S., C. A. Parsons & Company, Limited. Dr. H. J. Gough, C.B., D.Sc., F.R.S., Engineer in Chief, Lever Bros. & Unilever, Limited. Sir William Halcrow, M.I.C.E. Mr. M. B. Hoseason, M.I.E.E., Brush Electrical Company, Limited. Dr. C. H. Lander, C.B.E., D.Sc., Principal, Military College of Science. Professor N. F. Mott, F.R.S. Professor D. M. Newitt, M.C., F.R.S., Professor of Chemical Engineering, Imperial College. Sir Ewart Smith, M.I.Mech.E., Imperial Chemical Industries, Limited. Professor H. W. Swift, D.Sc., Professor of Engineering, University of Sheffield. Dr. C. Sykes, F.R.S., Director, Brown-Firth Research Laboratories.

Inspection Procedure

Copper-base Alloy Sand Castings

The publication of the above procedure as B.S. No. 1,367—1947 by the British Standards Institution represents an interesting and important development. The need for guidance in the difficult and somewhat controversial subject of the inspection of castings has been appreciated for some considerable time. Certain trends in current practice have now become sufficiently established to justify the formulation of a British Standard Code of Procedure, but the empirical nature of the recommendations is recognised throughout the document. The field of experience covered by the organisations co-operating in the preparation of the code and the usual wide circulation of the draft for comment in accordance with the established policy of the B.S.I., ensure that the resulting procedure reflects the best current practice from the point of view of both the foundry and the inspecting authority.

It is the purpose of the code "to indicate the procedures which will give the maximum possible information on the properties of sand castings with reasonable expenditure of materials, time and labour, and to standardise inspection procedure in order to facilitate industrial inspection and ultimately to assist both the designer and founder in improving the quality of castings."

Attention is drawn to the necessity of close co-operation between designer and founder at all stages and it is emphasised that this co-operation, particularly in the early stages, can greatly facilitate the work of both parties.

Castings are classified according to the service they have to perform and the methods of inspection are recommended for each class. The methods recommended for the inspection of material cover chemical analysis and mechanical tests. Tables are given in this section relating the number of chemical analyses to the number of foundry casts and the number of mechanical tests to the weight of castings. Inspection methods for castings are outlined together with the procedures recommended for destructive and non-destructive tests, the former including a table suggesting a suitable scheme for the number of destructive tests to be carried out on production castings.

Appendices give the dimensions of recommended standard forms of test bars and of the standard test piece for cast material. The code recommends that the wedge test bar should be adopted as the tentative standard for copper-base alloy castings. This recommendation is based on tests carried out on five different alloys, in which the results obtained from several types of test bar were compared. Details of these investigations were first published in a paper by F. Hudson (The FOUNDRY TRADE JOURNAL, June 20, 1946). Copies of the above standard can be obtained from the British Standards Institution, Publication Sales Department, 24, Victoria Street, S.W.1, price 2s. 6d., post free.

Effect of dissolved gas on the hot-tearing of Aluminium Casting Alloys*

By D. C. G. Lees, M.A.

It is a common practice in die foundries to introduce gas into the melt to reduce tearing in the finished castings. Experiments have been made to ascertain the magnitude of this effect, using tests developed during the work of the B.N.F.M.R.A. on the casting characteristics of aluminium alloys. The currently used range of aluminium casting alloys was examined in earlier work and a Paper[1] was published which related tearing tendency to eutectic content and included some evidence on the influence of grain-size and gas content.

For the present work, three alloys were selected which, when degassed, exhibit severe, fairly severe and slight tendencies to hot-tearing. The effect of various gas contents on these tendencies is described.

Experimental Procedure

Alloys Studied

Three alloys have been studied, *viz.*, a high-purity aluminium-4 per cent. copper alloy, an aluminium-6 per cent. copper alloy, and a commercially pure aluminium-5 per cent. silicon-3 per cent. copper alloy (D.T.D. 424). The first and last of these alloys were commercial materials in ingot form, and the second was prepared by adding cathode copper to the first. All three alloys contained 0.10 to 0.15 per cent. titanium, to ensure comparable fine grain.

Preparation of Melts

Melts (usually about 25 lb.) were made using Salamander pots in a gas-fired furnace. Degassing was performed by stirring with a flux containing two parts sodium chloride and one part sodium fluoride and, when gassy melts were required, hydrogen was passed through the melts at 750 to 780 deg. C. for periods varying from 15 sec. to 10 min. The absence of gas, or its presence in desired proportions, was checked before pouring by allowing a small sample, baled out in a preheated steel crucible, to freeze under reduced pressure (30 to 40 mm. mercury). To give a more quantitative indication of the gas content of some of the melts, density determinations were carried out on ½-in. dia. sand-cast bars, similar in form to the D.T.D. bar.

Test Castings Used

The hot-tearing test castings used were described in the earlier Paper.[1] In one of them (referred to as the test in sand moulds) centrally gated bars, 10 in. long and ¾ in. square in section, are allowed to freeze under complete or partial restraint of contraction. In the second test (referred to as the test in copper dies) flanged cylindrical castings with varying diameters of shank are cast vertically, free contraction being restrained by the flanges. The severity of this test depends on the diameter of the shank, the most severe test having a shank of ¾ in. dia. and the least severe test a shank of 1½ in. dia. These copper dies were preheated to 200 deg. C.

Pouring Temperature

A pouring temperature of 720 to 730 deg. C. was used in all cases. Castings were poured from a preheated steel hand ladle.

Results and Discussion

The aluminium-4 per cent. copper alloy is known to be very prone to tearing and in the test in sand moulds the bars freezing under complete and $\frac{9}{10}$ restraint, both showed tears when the melt was gas-free. Increase of gas content brought about no improvement even when the melt was saturated with hydrogen and the bars in the hot-tear test casting showed gross cavities easily visible to the naked eye in a polished section. The sand-cast bars made from the melts of highest gas content contained about 3 per cent. voids. A further series of tests made on this alloy in the copper-die test gave similar results, castings made in the 1¼-in. shank dia. test showing tearing irrespective of the gas content of the melt.

When the copper content was raised to 6 per cent., a casting made from a gas-free melt in the 1¼-in. shank dia. test showed tearing, but when a moderate amount of gas was introduced into the melt before pouring, this tearing, although still present, was reduced in severity. Further increase in gas content caused no apparent reduction in the severity of tearing.

D.T.D. 424 alloy (containing copper 2.89, silicon 4.83, iron 0.70 per cent., and usual impurities) was used to represent alloys, whose resistance to hot tearing, although high, is not so complete as that of the eutectic alloys (*e.g.* L.33). D.T.D. 424 alloy does not tear in the sand-mould test casting, but tears in the most severe of the copper die tests. A casting made in the ¾-in. shank dia. die from a degassed melt was torn, but when a melt containing a high gas content was cast in the same test, no tearing was found. A further test using an intermediate gas content also showed no tearing. In all three stages, the die-cast test-pieces showed lower voids than the sand-cast bars. The results are given in Table I.

TABLE I.—*Hot-Tearing Tests on D.T.D. 424 Alloy Melts of Varying Gas Content with Results of Porosity Determinations on Test Castings.*

Gas content as judged by reduced pressure test.	Voids, per cent.		Whether torn in ¾ in. shank dia. test in copper die.
	¾ in. Shank dia. test. (Copper die.)	Sand-cast test-bar.	
Nil	0.1	0.8	Yes
Moderate	1.1	1.7	No.
High	1.9	2.6	No.

* A paper presented to the Institute of Metals.

Aluminium Casting Alloys

(*Continued from page* 117.)

From these tests, it appears that the effect of dissolved gases, released during freezing on the hot-tearing of aluminium casting alloys, varies widely. In a 4 per cent. copper alloy saturation of the melt before casting does not reduce the high tendency to tearing, whereas in the case of D.T.D. 424 alloy, which is inherently much less prone to tearing, a moderate gas content, causing an increase in voids of about 1 per cent. in both sand and chill castings, renders the alloy immune from the defect under the conditions of test employed. In earlier work on hot-tearing it has been suggested that in alloys containing an adequate proportion of eutectic liquid, incipient tears set up in the network of primary crystals by restraint of free contraction may be healed by the flow of residual liquid into the resulting gaps. Such tears will tend to occur at local hot spots, where the network is less coherent, while the liberation of gas will be most advanced in the parts of the casting where solidification is more nearly complete. It is thus rational to suppose that the effect of gas liberated during freezing will be to drive residual liquid into zones liable to hot-tear. If this is the mechanism by which gas reduces tearing, it is understandable that the gas effect is more marked in alloys which have a relatively high eutectic content.

Summary and Conclusions

Three aluminium alloys, D.T.D. 424 alloy and binary aluminium-copper alloys containing 4 and 6 per cent. copper, have been subjected to hot-tearing tests using melts of widely different contents. D.T.D. 424 alloy of moderate gas content shows resistance to tearing equal to that of the eutectic aluminium-silicon alloys.

The 6 per cent. copper alloy is less affected by gas content, and the 4 per cent. copper alloy appears to be completely unaffected even when the melt is saturated with gas before pouring. From this limited evidence, it is tentatively concluded that, while dissolved gas tends to inhibit hot-tearing, the effect is small in comparison with that of other factors, notably eutectic content.

Acknowledgment

The author is indebted to the Director and Council of the British Non-Ferrous Metals Research Association for permission to publish this Paper.

REFERENCE.

1. D. C. G. Lees, *J. Inst. Metals*, 1946, **72**, 343.

Standardising Moulding Flasks

The foundry standardisation committee of the Mekanförbundet (Sweden) has worked out a preliminary proposal for the standardisation of moulding machine flasks. The proposed standard is based on data submitted by a number of Swedish ironfoundries as well as French and German standards, and includes length, width and height of the flasks, distance between the pins, size of pins, holes and lugs.

Moulding Problems

(*Continued from page* 115.)

7½ in. in depth, the weight being 58 lb. These castings were required in fairly large quantities.

The mould itself proved straightforward, the pattern being made so as to make use of a core covering the box section projecting on the outside and a coreprint the full diameter at the top of the pattern, so as to give a straight draw, the only section necessary to leave loose and drawn-in being rim (C).

The corebox for the main body was now constructed, the rim "A" being made in four segments so as to draw out sideways, this also applying to rim "D" which was drawn into the boss. The chief difficulty now arose—how to deal with the V-boxed section?

Provision must be made to draw this box out of the sand, and later to place the core for this boxed section into position. This box could only be drawn through the top of the corebox; it could not be drawn sideways owing to a section of the core which is clearly illustrated in the plan view. To draw the box section through the top meant that either a drawback must be cut above this section or a separate core made for this purpose. The drawback was favoured after trying both methods. After the box section was drawn the drawback was replaced and the core sent to the drying stove to be dried. Later when coring up the mould this drawback was again lifted out so that the core for the box section could be placed into position. It was then replaced. This method ensured a neat fit and eliminated the possibility of fin.

One must try to visualise how this core would appear. It is roughly conical, the 8 ribs cutting this cone of sand into 8 spires which are indeed very slim at their points, but special attention must be paid to the spires or pockets under the boxed section. The boxed section ruthlessly cut the support of the spires to the barest minimum.

After taking the greatest possible care in the moulding, coremaking and coring up, the losses sustained due to the breaking and washing of these badly supported pockets was extremely high. Every possible device was used in an attempt to overcome this; different types and strengths of sand were used; alterations of runners, risers and casting positions to relieve pressure were tried. But to no avail.

It was now felt that something more drastic must be done and it was decided to cast the portion of the boxed section which protruded into the inside of the cone separately and to weld it in afterwards. Provision was made to V all welding points so as to ensure penetration, and an accurate jig was made to hold everything in position while welding.

These castings were submitted for test and proved satisfactory, the benefits being in saving of the moulders' time by ¾ of an hour; losses due to cores breaking, nil; easier dressing in the fettling shop and less sleepless nights for the foundrymen. The welders' time was 23 min. for the welding in of the box section. The carbon content of the steel was 0.35 per cent.

German Spun Cylinder Liners*

Machine Design

It was found that the design of the centrifugal casting machines, used for the production of cylinder liners, followed normal British practice and many of the designs were clearly based on British models. The standard machines were generally of the direct drive type, driven through a shaft mounted in two roller bearings, with the steel holder bolted to a face plate. The pouring carriage and spout were also of a usual type and incorporated a side weir. At a Teves firm, the steel holder was cooled by a fine mist of water produced from four fine nozzles, each fitted with a separate valve. It was found that the mist was more efficient and produced no tendency to cracking of the moulds. Other firms generally appeared to rely, either on air-cooling or no cooling at all. The clearance between the die and the holder was generally kept at 0.5 mm. in the cold state. This was considered to produce tight contact between the die and the holder at operating temperature. The dies were usually machined on the bore to assist in holding the dressing. It was interesting to note that it was claimed that dies from an English firm had given better results than those produced in Germany.

Teves were doing experiments on mechanising the operations of the machine and had one or two machines equipped with doors closed by bobweights operated by a centrifugal force and also one with a pneumatic extractor. The door was carried on two rods extending along the side of the machine and coupled to the bobweights, which were so pivoted that on rotation of the machine the side rods were pulled back and the door thereby closed. The pneumatic extractor could be swung in and out of the axis of the machine at the appropriate moments; it penetrated in through the door and an expanding device was forced against the bore of the castings about a third of the length below the flange. The extractor was then withdrawn, the gripping device closed and the liner casting fell off the end of the extractor under its own weight on to a moving malleable iron conveyor belt running under the foundry floor along the line of casting machines.

Foundry Technique

Practice varied from firm to firm. At Teves and Krupp, cupola melting was employed and at Halberger Hütte melting was carried out in a gas-fired Brackelsberg† furnace. The Teves practice was an extreme example of a tendency found in several German foundries. Four cupolas were available, ranging from 700 to 900 mm. diameter. The furnaces were lined with a silica fireclay mixture rammed pneumatically around a former to a thickness of 200 mm. One cupola was run continuously for 100 hrs. without stopping, at the end of which period the bottom was dropped and the lining renewed in the melting zone. In general, one cupola was in operation, one being relined and two lined and ready for use.

Continuous tapping, both of iron and slag, was practised through syphon bricks. Fluorspar additions were made to keep the slag thin and, although the attack on the lining was severe for the first hour, it did not continue.

Charging Equipment

The charging equipment consisted of a vertical hoist bringing barrows to the charging platform, on which the coke and metal charges were weighed and carried by means of an overhead runway to a chute down which the skips were tipped to load the furnace. A typical charge at this firm showed 50 per cent. pig-iron and 50 per cent. scrap, the latter consisting of all forms of scrap, with the exception of turnings. The coke splits were 12 per cent. of the charge weight. An addition of 20 per cent. of the weight of the coke was made as limestone and 8 per cent. of the coke weight as fluorspar. If soda ash was employed, the addition was 4 per cent. Any alloys were added in the furnace and not in the ladle.

The Krupp melting practice showed no abnormal features, but the Halberger Hütte Brackelsberg furnace was unusual in being gas-fired. It was stated that this method of firing prevented the carbon loss often experienced in rotary oil-fired furnaces.†

The metal temperature at Teves, on tapping from the cupola, ranged from 1,350 to 1,370 deg. C. (measured by disappearing filament pyrometer originally, but in fact by eye) and the pouring temperatures ranged from 1,320 deg. C. for a thin liner to 1,250 deg. C. for a heavy liner casting. The corresponding pouring temperatures at Halberger Hütte ranged from as high as 1,400 deg. C. for small liners down to 1,200 deg. C. At Teves the dies were maintained at a temperature between 500 and 600 deg. C., approximately eight large liners or 11 smaller liners being cast per hour per machine. The practice at the other two firms appeared to be similar.

The die dressing procedure at Teves was unusual and complicated. In the first place, aluminium powder was blown in and distributed over the face of the mould. This was followed by a thin layer of fine sand and then by a layer of graphite. The graphite was added from a perforated spoon, which was itself mounted on a bar, the bar vibrating slightly from the machine vibrations. The spoon was moved up and down the bar for the full length of the die to obtain a good distribution of graphite powder. The net result was that the die dressing was abnormally thick and was estimated at 1 to 1½ mm. It was necessary for the dies to be comparatively rough machined to hold

* Extracted from B.I.O.S. Report No. 700—The German Centrifugal Castings Industry—by permission of the Controller of H.M. Stationery Office.

† To the British reader, the Brackelsberg furnace was understood to be fired by powdered fuel.—Editor.

Spun Cylinder Liners

this large quantity of dressing. A somewhat similar technique was employed by Krupp, who used about 60 per cent. graphite and 40 per cent. of aluminium powder. Both Krupp and Teves thought that, although the graphite was naturally fairly fine, it should be comparatively coarse and rough or "grainy" rather than flaky. It was also desirable that the carbon content should be fairly high according to Krupp. They, themselves, used graphite from the Siemens Plania works, as did Teves, whereas Halberger Hütte used a fairly fine graphite averaging about 0.03 mm., obtained from Austria (Steyr). They added about 1½ mls. per casting.

Mould Dressing

In the Teves plant, all the mould dressing was picked up by suction and through a filter. Particles of iron were first removed in a baffle filter and the dust then passed through a fabric bag filter which retained the graphite. The filtered graphite was mixed with fresh graphite and ball milled together, the mixture consisting of 40 per cent. of old graphite to 60 per cent. new. It was stated that the filtration plant had paid for itself in a short time.

Defects experienced differed from one plant to another. At Krupps, the principal trouble was with hardness, the total scrap amounting to about 10 per cent. on the average. Their Brinell hardness specification was 220 to 280 and the hardness was measured on the outside of the casting at a point near to the end remote from the pourer spout. A 10 mm. scrap ring was parted-off from this end on lathes fitted with air-operated chucks.

At Halberger Hütte the scrap was higher and ranged from 7 to 25 per cent. It was due to a number of causes, including pin-holes, chilling, eccentricity, dimensional troubles and slag inclusions. Teves experience with defects was normal and they were well aware of the effects of metal or mould being too hot, giving rise to gas-holes and blisters, probably due to oxide-carbon reactions.

Control tests did not appear to be used widely. A small wedge-shape was employed by Teves in theory, but the practical control appeared to be more by empirical tests on the castings themselves, such as file tests. Their hardness range was 220 to 260 Brinell, measured on the parted-off end. Halberger Hütte also applied a Brinell test and maintained a rather close watch on the microstructure, six or eight liner castings being examined from each furnace charge. On the section, their normal Brinell range was 200 to 220.

Sand Lined Practice

The Schalker Verein works at Gelsenkirchen had developed the casting of moderate-sized Diesel engine liners and large piston ring pots in sand lined moulds. The castings ranged from 300 to about 700 mm. diameter and were from 500 to 1,500 mm. long. The wall thicknesses also covered a fairly wide range, from 15 to 100 mm. In 1943 the monthly rate of production was 6,000 or 7,000 castings per month, totalling approximately 70,000 kgms. in weight.

The outer shell of the mould is of cast iron or steel and includes two bands which rest on two pairs of grooved rollers. In some cases the mould was direct driven by means of a transverse bar attached to the end of the shaft of the 16-kw. variable-speed d.c. motor, engaging slots in the end of the shell of the mould. In other cases, the support rollers had been driven.

At the speed of operation, 400 to 600 r.p.m., these machines had performed satisfactorily, but where the support rollers were driven it had been found that there was a tendency for the mould to ride over the rollers and to leave the machine. This is partly due to accumulation of *débris* on the surface of the support rollers, and it was found that cutting away the corners on each side of the bearing path on the support rollers tended to ease the removal of the *débris* and to reduce the tendency to jump from the machine. It was not a complete answer, however, and it was necessary to use top rollers. Even with one central sprung top roller, a case had occurred of the mould twisting out of the machine and causing considerable damage. Two sprung rollers were finally employed, one above each pair of support rollers. Sketches of final designs for further machines showed a very massive base, in which the support rollers were securely located in a manner which permitted of adjustment of their setting according to the diameter of the mould. On the base, a rigid pillar of heavy construction was erected and this, in turn, carried a massive horizontal arm with a screw adjustment to firmly hold the top sprung roller in place above the mould.

Sand Coating

Great care was taken over the sand coating. The sand was a normal sand with a clay bond and was rammed pneumatically. The ramming was so hard that it required a 50-ton capacity press to pull the mould off the former. The thickness of the sand lining ranged from 3 to 7 cm., and would have averaged 5 cm. in wall thickness. It will also be noted that the end of the mould was closed by a steel plate protected by a 3-mm. thick sand core where it would have been in contact with the molten iron. The sand was coated with a blacking clay wash mixture and great care was taken in applying this wash, since it was believed to be essential to prevent burning on. After ramming, the whole mould is dried, and is raised to a temperature of 150 to 200 deg. C., on occasions going as high as 300 deg. C.

The normal range of analysis, together with two typical examples, is quoted below. The Brinell hardness values are also shown:—

—	Specification.	Ex. 1.	Ex. 2.
	Per cent.	Per cent.	Per cent.
C	3.0 to 3.2	3.17	3.03
S	1.8 approx.	1.45	1.89
Mn	0.7 to 1.0	1.04	0.87
S	Less than 0	0.062	0.089
P	0.5 to 0.6	0.65	0.61
Brinell hardness	180 to 220	202	207

(*Continued on page* 122.)

Scrap . . . . . Supplies

A not inconsiderable percentage of scrap is used in the making of castings and the following is an extract from "The Iron & Steel Development Plan" published by the Statistical Department of the British Iron & Steel Federation.

Two points regarding the supply of capital scrap emerge at once from an examination of the position. The first is that supplies coming forward tend to increase when trade is declining and to fall away in periods of increasing trade activity. The relation of the capital scrap and steel ingot cycles is not uniform and the figures suggest that the capital scrap cycle tends to lag fully a year behind the steel output cycle. Thus, one year after the 1921 low point in steel output, capital scrap supplies had risen to a peak level. On the other hand, following the 1929 peak of steel output, capital scrap by 1930 had fallen to the low point in its cycle. As steel output declined rapidly after 1929, so capital scrap supplies increased equally rapidly after 1930. The bottom of the decline in steel output was reached in 1931 and 1932 and the peak of capital scrap supplies in 1933. The rise in steel output after 1932 was associated with a marked decline in capital scrap supplies after 1933. The figures for 1937 indicate that in spite of the efforts made in that year to augment scrap supplies, it was not possible to overcome the strong tendency for capital scrap supplies to decline in a period of active trade.

The decline in capital scrap continued until 1940, a year after the highest level of steel production yet reached, *i.e.*, in 1939. During the war period, capital scrap supplies tended to rise, partly, of course, owing to the special efforts made to secure additional supplies from abnormal sources such as railings, blitzed buildings, etc. and in 1945 and 1946 through the scrapping of war surpluses of various types.

The behaviour of the scrap cycle suggests that, in periods of improving trade, the new plant and equipment required by industry is used primarily not to replace, but to augment existing equipment. The tendency to make additions rather than replacements, whether it be to the capacity of a factory or to the tonnage of a fleet of ships, becomes more marked as the peak of trade activity is approached. At the peak of trade activity the ear-marking of plant for scrapping reaches a minimum and, since there must be some lag between the decision to scrap, or, in this case, not to scrap and the accruing of scrap to industry, it is approximately a year later before the capital scrap supplies to steelmakers reach a minimum. During a period of declining trade, much of the old plant which was retained during the preceding expansion will be progressively withdrawn from production and scrapped.

The question of scrap supplies has so far been discussed without any reference to the price of scrap. Since circulating and process scrap are mainly governed by the level of steel production and consumption respectively, the main item which should respond to changes in the price of scrap would be the supplies of capital scrap.

There is no apparent tendency for increased prices to be associated with increased supplies of capital scrap. The fluctuations support the view that the supply is mainly governed by the physical considerations referred to previously, rather than by changes in price. Indeed, there is a good deal to be said for the view that the main factor, on the price side, in promoting the flow of scrap is price stability and that a fluctuating price at least tends on the whole to lead to the withholding of scrap under conditions under which it appears likely to move upwards. The policy in recent years has been to keep the price steady and to rely in the main on the natural factors promoting the growth of supply to operate, supplemented by exceptional measures which have contributed substantially during the war period, to augment supply by recovery from marginal sources.

The cycle in the supply of capital scrap is of particular importance in causing the demand for steelmaking pig iron to fluctuate even more widely than the output of steel. Thus the consumption of pig iron by the steel industry fell from over 5 million tons in 1929, to 2·2 million tons in 1932, then rose to over 6 million tons in 1937.

Trend in Supplies

The second major point brought out by the figures relating to capital scrap is that, underlying the cyclical fluctuations, there has been a marked upward trend in supplies over the period as a whole. In the years 1920 to 1925, the average supplies available amounted to 660,000 tons a year, from 1927 to 1931 to 1,170,000 tons, and from 1932-1937, they averaged 1,620,000 tons. While the year-to-year fluctuations in capital scrap supplies are governed by changes in trade activity, the underlying trend is related to the volume of domestic steel consumption at some earlier period. As, in spite of temporary setbacks, the trend of steel consumption in this country over a long period has been decidedly upward, it may confidently be expected that capital scrap supplies for many years to come will show, on balance, a marked upward tendency.

On the whole, the rate of increase in capital scrap supplies is decidedly greater than the rate of increase in steel consumption in this country over any equal period in the past fifty years. One possible explanation of this differential in the rates of increase in that there has been a gradual shortening in the life of machinery and other products made from steel. There are grounds for supposing that improvements in production technique and scientific advances, have tended to accelerate the obsolescence of structures, plant, machinery, etc., while the proportion of finished steel output, which passes direct into consumer goods, such as motor cars, hollow-ware, cans for food, etc., has tended to increase. Developments of this kind have a marked effect in shortening the life of steel and so augmenting the effect of increased quantities in use by its more rapid turnover.

Scrap Supplies

Future Scrap Supplies

In estimating the probable forward supply of capital scrap, it appears likely that an increase of about 35 per cent. over the pre-war supply, or an increase very similar to that estimated for process scrap, might be reached by the years 1950 to 1960. This would mean about 2,130,000 tons a year compared with an average of 1,570,000 in the period 1934 to 1938. This estimate is rather below the figure indicated by a projection of the pre-war trend of capital scrap arising, but makes some allowance for the fact that the average life of steel in use may not continue to decrease at the same rate, and for the probable increase in the proportion of steel being used by industry in this country which will eventually find its way into export markets and not be available for scrap. The effect of the latter factor on capital scrap supply, however, is likely to be delayed and the strong upward trend in steel consumption in this country must inevitably have its effect in increasing the supply of capital scrap in the future.

As the analysis of the figures indicates, however, if the next few years are a period of high industrial activity and heavy demand for steel, the tonnage of capital scrap arising will, for a time, remain at a low level, apart from such tonnages as are secured from war demolitions. It is clear, for example, that the scrapping of cars and of plant generally cannot proceed quickly until new products are available to replace them. In the case of the steel industry itself, the development programme must largely precede the scrapping, which will ultimately be possible. While, therefore, for a period of years capital scrap supplies are likely to be very low, making it necessary to secure the maximum possible quantity of imports to supplement home supplies, taking a longer view, the overall position is likely to improve.

Estimate for the Future

It looks as though the increase in both process and capital scrap would approximate 35 per cent., raising supplies, which averaged 3.24 million tons in the five pre-war years, 1934 to 1938, to about 4.47 million tons. On the assumption that exports are negligible or very minor, the figure taken for the future available home scrap, other than circulating, is 4½ million tons. It is on this figure that the estimate was made in the White Paper that there would be a total supply of scrap of about 8 million tons. This includes 3½ million tons of circulating scrap estimated at 25 per cent. of ingot production. It leaves an import requirement of 250,000 tons to provide a 55 per cent. scrap ratio. This compares with a scrap usage in 1937 of 57½ per cent., or a total consumption of 7½ million tons used in the making of 12,980,000 tons of steel. The supply in 1937 was made up of 6½ million tons from home sources and 1 million tons from imports.

The foregoing figures are, of course, very speculative and they may conceivably represent an over-optimistic assessment of future supplies. The increase estimated is so large that it may well be that a more cautious approach to the question is desirable. On the other hand, a conservative estimate has been made of available imports and it is possible that additional supplies could be secured from abroad. Such additional imports may be particularly desirable to enable the upper limit of production visualised in the Plan to be exceeded if demand conditions make this desirable.

Of the imports which averaged ¼ million tons a year in the four years prior to the war, about two-thirds came from the U.S.A. The supply of scrap from America in periods when the steel industry there is operating well below full capacity is substantial, and considerable tonnages might again be secured in such circumstances. Under present conditions, however, when capacity is fully employed, the whole of the American scrap is absorbed in domestic production. On the whole it appears probable that a higher level of activity will be maintained in the United States, and it is very doubtful whether anything approaching the supplies secured in the years shortly before the war can be relied on again. The development of electric furnace production and the increased attention paid to the use of domestic scrap supplies, reduce the possibility of securing considerable supplies from other countries. It would probably be over-optimistic to rely on securing imported scrap at an average rate of more than ½ million tons per annum in the future, apart from special possibilities in the next few years.

Pig Iron Supplies

On the basis of the foregoing estimate of scrap supplies, it is calculated that blast furnace capacity for the production of basic and hematite pig iron of approximately 9,100,000 tons per annum will be required to balance steel furnace capacity of 16 million tons and provide 500,000 tons of hematite for iron castings. This is an increase in pig iron capacity of 1,780,000 tons associated with an increase in steel capacity of 1,850,000 tons.

Spun Cylinder Liners

(*Continued from page* 120.)

The structure was stated to have shown even flake graphite of the type found in static sand castings in a matrix consisting essentially of pearlite with only traces of ferrite. The machining allowance was 1 mm. per 100 mm. of diameter on the O.D., *i.e.*, on a 500-mm. O.D. casting the machining allowance was 5 mm. The machining allowance on the bore ranged from 7 to 10 mm.

Before adopting centrifugal casting their scrap on these cylinder liners was in the order of 50 per cent., but, after centrifugal casting, the scrap was reduced to about 1 per cent. This was due usually to cold laps, resulting from carelessness in pouring or from cold cores in winter-time. It was noticed that a crazy marking appeared on the bores when the machines were vibrating.

Considerations in the Purchase of Patterns*

By W. G. Schuller

One of the greatest problems facing the foundry industry to-day is control and reduction of costs. In this connection, how many foundrymen give due thought and consideration to the making and purchasing of good pattern equipment—pattern equipment which can be put to most efficient use?

For the past five years, foundries have enjoyed non-competitive markets, but as times become normal they will face a buyer's market. The requirement then will be new and better equipment to increase productivity. That situation will also call for pattern equipment, which will eliminate the human element, such as the blowing of more intricate shaped cores, which gives more uniformity and lowers costs in the foundry.

The many problems involved in the purchase of patterns can be divided into those arising out of purchases for captive foundries and those connected with purchases for commercial foundries. A purchasing agent's greatest problem, however, is to secure from the foundry detailed information as to the exact kind and type of pattern required.

Pattern Purchasing Procedure

Here is typical procedure. The purchasing agent receives a requisition calling for purchase of a pattern needed to make x number of castings per year. The castings are to be in production by a certain date. He must requisition drawings to find out what he is to purchase. It then becomes necessary to contact the foundry to determine the kind of pattern desired, the number on a plate, whether a gang box is needed, how many driers are required, etc.

Usually, the foundryman says, "Oh, put four patterns on such a size plate and make 50 driers for the body box." What little information he can obtain, the purchasing agent passes on to the pattern shops from which he expects quotations. Obviously, before a pattern shop can give an intelligent quotation it must obtain much more information. This is done usually by letter or telephone. Even then, there are many interpretations of a drawing. The most logical course for the patternmaker is to make the best pattern he can, on the basis of the data furnished. Naturally, he will not wish to offend the customer by pointing out a failure to furnish necessary information.

After the foundry receives the pattern, the purchasing agent gets a call from the foundry superintendent, who demands to know how in the world he is to gate the pattern, when there is not enough room between patterns for a riser, etc. The purchasing agent calls the pattern shop and reports the superintendent's objections. Now there are three dissatisfied parties and a pattern which will always be a problem in the foundry. This is happening every day. The situation calls for closer co-operation and understanding between the foundry and the purchasing department.

A purchasing agent is in daily contact with sales people, and frequently makes plant visitations. He is able, therefore, to keep abreast of the latest production methods and new equipment. With this information he can buy quality at the lowest price and get value for money spent. Purchasing of patterns for a captive foundry is considerably simpler than purchasing for vendors. A purchasing agent has knowledge of his company's foundry and is familiar with its moulding and coremaking facilities; in most cases he has purchased the equipment. However, it is becoming imperative that he know his vendor's facilities equally well because they are just as important.

Most commercial foundries do not have their own pattern shops and rely on commercial pattern shops for new patterns. This creates another problem for the purchasing agent, since he must know the type of equipment required by his vendor.

Pattern Flexibility

During the war, the purchasing agent learned many things as a result of the migration of his patterns. At that time migration reached a high level due to the inability of many foundries to produce castings in required quantities. This taught the purchasing agent to make his pattern equipment more flexible, to get away from any special equipment required by his suppliers. It also encouraged castings suppliers to standardise on commercial machines and flask equipment and thus to reduce the possibility of endangering their customer's production because of a breakdown or labour trouble which would require a new pattern to be made.

An example of the aforementioned problem of special equipment is the case of a foundry which changed to large match-plate work, namely 15 × 32-in. plates, and used snap or pop-off flasks under a Sandslinger. From a purchasing agent's viewpoint, this equipment was relatively inflexible since there are very few foundries able to handle match-plate work of this size. Although the agent fully realises this equipment could reduce some foundries' costs, he must give consideration before sanctioning this type of pattern equipment.

A purchasing agent must know the intricacy of the casting he has to buy in order to determine the type of equipment to purchase. Frequently, the cheapest pattern is the most expensive. A pattern can be made cheaply, so as to hold down initial costs. However, in almost every case, when a quantity of castings is required, the cost is excessive if pattern equipment is inadequate. Cheap patterns always tend to raise foundry costs and, certainly, uniform castings cannot be obtained from them.

There are also the problems of high maintenance costs. A purchasing agent must know the number of

* A Paper delivered to the Annual Meeting of the American Foundrymen's Association.

Purchase of Patterns

castings required from a pattern to help determine its construction. When castings are of intricate design, it is often cheaper to make metal equipment for only a small quantity. Metal equipment can save money for a foundry and for the machine shop, which will have more uniform castings to machine. A purchasing agent must keep these factors in mind; he must consider a job from an overall standpoint.

There is always the problem of making patterns interchangeable. Here the cost of interchanging should be the guide. Where frequent changes are necessary, the cost of changing may equal or exceed the cost of separate equipment for each job. Separate equipment increases the flexibility of pattern equipment. When all factors are considered, the initial cost of good production pattern equipment is certainly a small item compared to losses in costings traceable to a cheap pattern. There is an increasing need for pattern engineering in foundries. The requirement is for someone who can co-ordinate pattern and flask equipment and show customers where they can save money.

Pattern Engineering

Pattern engineering in a foundry does not, in any sense, require elaborate arrangements. The only essential is someone who can read a blueprint and can indicate parting lines, core prints, and the type of core boxes, driers, etc., which are needed. Such information clarifies points for the purchasing agent, who, in turn, can pass it on to pattern shops, enabling them to quote more intelligently and on a competitive basis. It also serves as a record for the foundry. A pattern engineer frequently can be helpful to the designer by straightening out a wall or running a boss down to the parting line to eliminate a core. Such changes reduce pattern and casting costs. A purchasing agent should encourage his vendors to offer suggestions, and should use their suggestions whenever possible.

A purchasing agent must watch the care and use of patterns at his vendors' plants. Many thousands of dollars have been invested by his company to supply good pattern equipment, and much money may be lost in rejected castings if care and maintenance of patterns is below par.

The foundry industry to-day is challenged by welded and fabricated parts. In the past few years foundries have made the purchasing of castings difficult because they preferred to run the easier types, thus forcing purchasing agents to go to new fields for substitutes. A veteran foundryman once said that "when they start fabricating odd shaped manifolds," he would give up the foundry business. To-day you can buy many odd-shaped manifolds for half the cost of castings. However, the threat that other products will replace castings need not become serious, if quality is maintained in castings at the consumer's specifications.

Good pattern equipment is basic to production of good castings. The old saying—"a casting is only as good as the pattern from which it is produced"—remains true.

Book Review

"Aluminium Alloy Castings; their Founding and Finishing," by E. Carrington, M.Sc. Published by Charles Griffin & Company, Limited, 42, Drury Lane, London, W.C.2. Price 25s.

Whilst the literature of aluminium and its alloys is truly enormous, it is an extraordinary fact that this new book is the elementary text book devoted to the subject of light alloy founding practice. There is a tacit guarantee, in a well-written introduction, that the book is to be kept to the level of the practical man, and this has been done. The arrangement of the book is virtually chronological, and a start is made with the quotation. The author's method of dealing with moulding cost by basing it on the cubic feet of sand rammed per hour by the method used, is, to the reviewer's mind, inadequate. Otherwise the form printed on page 8 is satisfactory. The estimation of delivery date has been over-simplified and the system given only applies to smaller concerns. Perhaps this is for the best as the larger concerns will have planning departments of their own, to the general pattern of which all orders must conform.

Chapter 3 covers the basic principles of die making, and most of the common faults are adequately covered. Melting is covered in great detail, no fewer than 46 pages being devoted to it. Moreover, there are some 6 pages of references, but in these there are too many references to German literature and too few to French. Sand control, of which the published literature is now very extensive, has been well handled by the author. He has certainly brought into relief the major factors to be considered in light alloy practice.

The first half of Chapter 6—Moulding and Sand Casting—will certainly appeal to the practical man, whilst the second portion is just more or less a review of the machinery normally available. Next there is a chapter on die preparation and casting and one cannot help but feel that this subject could do with even more extensive treatment. Much work is still required before it can be presented comprehensively. This will take time. At the moment, it is difficult to separate proposals from solid accomplishments.

The chapter on heat treatment was approached with special interest, as here was the test as to whether the subject could still be kept practical. The author has succeeded well. Because the aluminium industry was born in the laboratory, the metallurgist has always had much influence in the operation of the light alloy foundries. He had to get accustomed to practice just as the practical steel maker had to absorb some elementary ideas of science. The author has indicated in Chapter 10 just how the metallurgist fits into the picture, aiding without dominating.

In general, this book has supplied the urgent need for an elementary text book on aluminium foundry practice, and the reviewer strongly recommends its acquisition by all the younger people engaged in this still young industry.

V. C. F.

Control of Bolts, Nuts and Screws

The Minister of Supply has made the Control of Bolts, Nuts, Screws, Screw Studs, Washers and Rivets (No. 13 Order), 1947, which came into force on May 23. The Order amends maximum prices, the principal alterations being increases in prices of bright-steel bolts, nuts, screws, screw studs and washers; metal thread screws (rolled threads); socket set and cap screws; wood screws; and mild-steel rivets (under ½-in. dia.). Price control is removed from steel metal-thread screws and nuts (turned threads). Following are details of the changes made by the new Order:—

Black Bolts and Nuts to B.S.S. 916/1940 and B.S.S. 325/1928 or other standards.—Minor amendments to packing terms.

Cup Square Square Carriage Bolts and Nuts.—Additional discount to merchants reduced by 1 point.

Bright Steel Bolts, Nuts, Studs, etc.—Prices increased by approximately 4½ per cent. and minor amendments to length ranges.

Bolts and Set Screws to B.S.S. 1083, Grades "A," "B," and "C," hot-forged and machined under head and on shank.—Prices increased by approximately 3¾ per cent. and minor amendments to length ranges.

Bolts and Set Screws to B.S.S. 1083, Grades "A," "B" and "C," cold-headed.—Minor amendments to length ranges.

Forged and Heat-treated Bolts and Set Screws to B.S.S. 1083, Grade "D," Series F.B. 100.—Minor amendments to length ranges.

Nuts to B.S.S. 1083/1942, Grade "L."—Prices increased by approximately 3¾ per cent.

Bolts, Nuts and Studs to Admiralty Schedule 92.—Prices increased by approximately 3¾ per cent. and minor amendments to length ranges.

Bolts to Admiralty Schedule 92A, Tensile 45/55 tons.—Minor amendments to length ranges.

Alloy Steel Bolts to Admiralty Schedule 92A.—Prices increased by approximately 2½ per cent. and minor amendments to length ranges.

Steel Studs to B.S.S. 1083, Grade "D," and Admiralty Schedule 92A, carbon and alloy steel.—Prices for carbon-steel studs increased by approximately 3¾ per cent.; for alloy steel studs by approximately 2½ per cent., and minor amendments to length ranges.

Aircraft Screws, A.G.S., mild steel, rolled and turned threads.—Prices for turned threads withdrawn.

Metal-thread Screws and Nuts, steel, turned from the bar.—Prices withdrawn.

Metal-thread Screws, steel, rolled threads.—Discounts reduced by 1¼ points.

Socket Set and Cap Screws, steel.—Discounts reduced by 2½ points.

Wood Screws, steel.—Discounts reduced by 2½ points.

Rivets, steel, ½-in. dia. and over and for the Admiralty and British railway companies.—Prices for rivets under ½-in. dia. increased by approximately 21 per cent.

Small Rivets, steel, under ½-in. dia.—Schedule re-edited and prices increased by approximately 21 per cent.

News in Brief

ORDERS FOR EIGHT VESSELS have been received by the Furness Shipbuilding Company, Limited, Haverton Hill-on-Tees. They include six motorships each of 1,850 tons for Stockholm owners.

THE AMALGAMATED UNION OF FOUNDRY WORKERS has protested to the Minister of Supply and asked for an explanation of raw-material shortages, following a fall in the production of light castings.

MEMBERS OF THE Boilermakers' and Iron and Steel Shipbuilders' Society who believe they are suffering from ailments caused by welding have been asked by their association to send details to the Society's head office.

IMPERIAL CHEMICAL INDUSTRIES, LIMITED, plan to build a factory on Liverpool Corporation's trading estate at Kirkby, to employ eventually 3,000 men. It will make copper tubes and other light-metal products, mainly for export.

THE BLYTH SHIPBUILDING & DRY DOCKS COMPANY, LIMITED, Blyth, have received orders for two cargo vessels of 3,500 tons for Bergen owners. The engines will be supplied by the North Eastern Marine Engineering Company, Limited, Wallsend.

MR. PHILIP MURRAY, president of the United Steel Workers' Union of the Congress of Industrial Organisations issued an order recently to steelworkers forbidding them to strike for two years. The steelworkers' union recently obtained substantial wage increases from all big steel companies.

NEGOTIATIONS HAVE BEEN CONCLUDED between Metropolitan Vickers Electrical Company, Limited, Manchester, and the Ministry of Supply for the acquisition by Metropolitan Vickers of the Watling Street factory at North Motherwell, at present used by the Ministry as a surplus stores and equipment depot.

A CALL for £1 a week increase in wages is made in a number of resolutions to be proposed at the annual conference of the Amalgamated Foundry Workers at Ayr from June 17 to 20. Several district committees are also seeking a 44-hr. guaranteed week, and 12 days' annual holiday with pay is the demand voiced in other resolutions.

THE ENGINEERING INDUSTRIES ASSOCIATION has sent a questionnaire to each of its 3,000 members which shows that 81 per cent. of the firms were engaged in export, and all except 22 per cent., wished to expand their overseas trade. An analysis of the proportion of products sent overseas shows that 14 per cent. export 5 per cent. or less of their products and 10 per cent. export between 5 and 10 per cent.

THE INTERIM FINANCIAL STATEMENT for the three months to March 31, 1947, issued by the International Nickel Company of Canada, Limited, shows a net profit, in terms of U.S. currency, of $7,929,845, after all charges, depreciation, taxes, etc., equivalent, after preferred dividends, to 51 cents per share on the common stock. This compares with a net profit of $5,588,055, or 35 cents a share, for the corresponding quarter of 1946, and $10,125,343, or 66 cents a share, in the last quarter of 1946.

Rising Costs and Prices

Danger to Engineering Industry

Viscount Weir of Eastwood, chairman of G. & J. Weir, Limited, in a statement accompanying the annual report and accounts, comments on the way costs and prices have risen. The company, he says, has been quite unable either to stabilise costs or to reduce them.

"To the ultimate users of our products, for example, the shipowner and the power-station authorities, be they British or foreign, the question of price stability is vitally important," says Viscount Weir. "It is our duty to recognise and appreciate this. We have to think of the future and recall that the seller's market will not persist, and we hope to do our best to retain these customers. In a world of scarcities and of sectional political pressure we find this aspect lamentably neglected. In wartime, production alone was the main task; in peace, we have the much harder problem of production qualified by cost and price. Under to-day's conditions in this country, far too little attention is being paid to the importance of the peacetime yardstick of cost. Some of our larger contracts involve a period of over two years before they are completed, and to-day we have no idea what we will have to pay for British coal during that period. The price of coal conditions the price of steel, which is the basis of the engineering industry. Since 1939, the prices of British steel have stood out as models of relative price stabilisation, but if the prices of coal, and of rail transport are to rise, as seems inevitable, then the price of steel will also rise. Almost every branch of British industry is adopting a shortened working week, largely with maintenance of existing remuneration. We have still to find the extent to which this will result in increased costs and prices in most industries. These examples concern prices which are to a considerable extent within our national control, but we have, in addition, the international prices of, say, the non-ferrous metals and timber, which to-day stand at almost famine prices. These may go still higher, but there is little we can do to remedy this. Rising costs coupled with material shortages and a measure of doubt as to the supply of the main fundamentals of industry, in particular, coal, power, rail transport and steel, seem to represent the greatest dangers which face the engineering industry."

Contracts Open

Any date given is the latest on which tenders will be accepted. The address is that from which forms of tender may be obtained.

Lothingland, June 30—Provision, laying and jointing of about one mile of 7-in., 6-in., 5-in. and 4-in. cast-iron pipe mains, etc., for the Rural District Council. A. P. I. Cotterell & Son, engineers, 54, Victoria Street, Westminster, London, S.W.1. (Fee £2 2s., returnable.)

Workington, June 30—Approx. 9,800 yds. of spun-iron concrete-lined pipes, 18-in., 12-in., 9-in. and 8-in. dia., etc., for the Corporation. Herbert Lapworth Partners. engineers, 65, Victoria Street, London, S.W.1. (Fee £3, returnable.)

Steel Industry and Nationalisation

Colvilles, Limited, have prepared plans for major extensions, which will be carried out as soon as circumstances permit. Sir John Craig, the chairman of the company, in a statement which accompanies the annual report, says that in former days, having reached such a decision they would have proceeded with their schemes forthwith. That is no longer possible, and it is now necessary that the consent of many interests be first obtained. "We wonder sometimes whether in this process the consumers of steel in this country, who are suffering so severely from a lack of steel supplies, are not being asked to sacrifice too much in the interests of a planning policy which concentrates on the long-term aspect and forgets immediate necessities." says Sir John. "There are references from time to time to the Government's policy concerning the steel trade and to their schemes for bringing the industry under Government ownership. In consequence, there is great uncertainty throughout the industry. In our view, any decision to nationalise a complex industry like the steel industry could not be otherwise than damaging to the national economy. We have little faith in the benefits which, it is stated, arise from centralised control, and we think that many of the ideas current on this subject at the present time exaggerate the assumed benefits, which have not been proved, and do not emphasise sufficiently the dangers which are latent in such policies."

Mr. Dalton, Chancellor of the Exchequer, said recently that after transport and electricity had been nationalised there would remain only two big things still to be accomplished—iron and steel and gas. "You may take it from me and my colleagues," he said, "that both of those nationalisations will be carried through before our five years are out."

Obituary

MR. JOHN S. MARTIN, general manager of T. W. Greenwell & Company, Limited, shiprepairers, of Sunderland, died recently at the age of 65.

MR. A. ALBRECHT, of the North British Engineering Equipment Company, Newcastle-upon-Tyne, died recently. He was a director of the Electrical Wholesalers' Federation.

MR. LEONARD SOUTHALL, of Edgbaston, Birmingham, died recently at the age of 79. He was a managing director of Hudson, Edmunds & Company, Limited, tube manufacturers.

MR. JOSEPH WEBB, a director and works manager of John Thompson Motor Pressings, Limited, Wolverhampton, died recently, aged 64. He had been associated with the firm for 36 years and was awarded the British Empire Medal in 1944.

MR. WILLIAM H. MORTON, a director and secretary of Bruce Peebles & Company, Limited, engineers, of Edinburgh, died suddenly last month. He was born in 1881. Mr. Morton was appointed accountant of the company in 1909, and secretary in 1913. He joined the board in 1943.

Pig-iron and Steel Production in Great Britain

Statistics for March, 1947

The following particulars relating to pig-iron and steel production in Great Britain have been extracted from the Statistical Bulletin for April, 1947, issued by the British Iron and Steel Federation. Table I gives the production of pig-iron and ferro-alloys in March, with the number of furnaces in blast at the end of the month; Table II, production of steel ingots and castings in March; and Table III, deliveries of alloy and non-alloy finished steel. Table IV summarises the activities of the steel industry as a whole during the six months ended March, 1947.

TABLE I.—*Weekly Average Production of Pig-iron and Blast-furnace Ferro-alloys in March*, 1947. (*Thousands of Tons.*)

District.	Furnaces in blast, 29.3.47	Hematite.	Basic.	Foundry.	Forge.	Ferro-alloys.	Total.
Derby, Leics., Notts., Northants, and Essex	24	—	11.0	16.3	1.7	—	29.0
Lancs.(excl.N.W. Coast),Denbigh, Flints.and Ches. Yorkshire (incl. Sheffield, excl. N.E. Coast)	5	—	5.5	—	—	0.6	6.1
Lincolnshire	10	—	16.1	—	—	—	16.1
North-East Coast	25	4.7	24.7	0.8	—	1.2	31.4
Scotland	10	0.6	7.2	2.6	—	—	10.4
Staffs., Shrops., Worcs.,Warwick	4	—	3.8	0.1	—	—	3.9
S. Wales and Monmouthshire	7	1.7	12.7	—	—	—	14.4
North-West Coast	7	11.6	—	0.2	—	—	11.8
Total	92	18.6	81.0	20.0	1.7	1.8	123.1
February, 1947	92	20.1	83.6	19.0	1.5*	1.9	126.1
March, 1946	97	21.5	100.9	20.7	1.4	2.8	147.3

TABLE III.—*Weekly Average Deliveries of Alloy and Non-alloy Finished Steel.* (*Thousands of Tons*).

Product.	1946	1947 (1st 3 months).	1946. Mar.	1947. Feb.	1947. Mar.
Non-alloy steel:—					
Heavy rails and sleepers	9.0	7.3	9.9	6.6	7.4
Heavy and med. plates	30.9	27.9	32.4	26.7	25.8
Other heavy products	31.9	28.8	32.8	25.6	28.1
Light rolled products (excl. wire rods and alloy-steel bars)	48.9	46.3	50.8	39.2	49.2
Ferro-concrete bars	3.2	2.4	3.6	2.2	2.7
Cold-rolled strip	4.2	4.4	4.1	3.5	4.7
Bright steel bars	4.5	4.2	4.0	2.6	5.1
Sheets, coated and uncoated	22.4	23.3	23.4	21.1	22.2
Tin,terne and black-plate	10.4	11.5	11.2	11.6	9.9
Tubes and pipes	14.0	11.6	15.2	10.0	12.3
Steel wire	11.8	10.1	12.3	7.7	10.7
Tyres, wheels, axles	3.4	3.3	3.4	2.7	3.5
Forgings	4.9	4.5	5.2	3.8	4.7
Castings	2.9	2.7	3.1	2.2	2.9
Total	202.4	188.3	211.4	165.5	189.2
*Alloy steel**:—					
Plates	0.3	—	0.4	—	—
Tubes and pipes	0.2	0.3	0.1	0 2	0.3
Bars, sheets, strip and wire	2.9	3.1	2.8	2.6	3.3
Forgings	1.6	1.5	1.5	1.1	1.4
Castings	0.6	0.5	0.7	0.4	0.6
Total	5.6	5.4	5.5	4.3	5.6
Total production†	208.0	193.7	216.9	169.8	194.8
Less Intra-industry conversion	16.4	13.6	16.3	8.6	15.6
Net U.K. deliveries	191.6	180.1	200.6	161.2	179.2
Add Deliveries of imported finished steel	—	—	—	—	—
Total finished steel	191.6	180.1	200.6	161.2	179.2

* Excludes high-speed steel.

† Includes finished steel in the U.K. from imported semi-finished.

TABLE II.—*Weekly Average Production of Steel Ingots and Castings in March*, 1947. (*Thousands of Tons.*)

District.	Open-hearth. Acid.	Open-hearth. Basic.	Bessemer.	Electric.	All other.	Total.* Ingots.	Total.* Castings.	Total ingots and castings.
Derby, Leics., Notts., Northants and Essex	—	—	(Basic) 6.5	0.9	0.4	7.3	0.5	7.8
Lancs. (excl. N.W. Coast), Denbigh, Flints. and Ches. Yorks. (excl. N.E. Coast and Sheffield)	1·5	15·4	—	0·3	0·4	16·8	0·8	17·6
Lincolnshire	—	17·4	—	—	0·1	17·4	0·1	17·5
North-East Coast	1.8	37.4	—	0.6	0.4	39.0	1.2	40.2
Scotland	4.2	24.3	—	0.9	0.6	28.7	1.3	30.0
Staffs., Shrops., Worcs. and Warwick	—	9.2	—	0.7	0.6	9.4	1.1	10.5
S. Wales and Monmouthshire	5.1	29.4	(Basic) 1.8	0.7	0.1	36.9	0.2	37.1
Sheffield	5.9	16.7	—	5.9	0.5	27.5	1.5	29.0
North-West Coast	0.2	2.5	(Acid) 3.6	—	—	6.2	0.1	6.3
Total	18.7	152.3	11.9	10.0	3.1	189.2	6.8	196.0
February, 1947	20.5	161.9	14.0	7.4	2.4	200.4	5.8	206.2
March, 1946	25.0	199.8	18.9	9.3	2.7	249.4	6.3	255.7

* Including alloy steel.

(*Continued at foot of next page.*)

Personal

MR. J. P. FITZGERALD has been appointed a director of the Zinc Corporation, Limited.

MR. D. A. WILLSHAW has been appointed a director of Crossley-Premier Engines, Limited.

MR. L. T. DAWES has been elected a director of Beyer, Peacock & Company, Limited, in place of the late Sir Francis S. Jackson.

MR. JOHN T. HOBKIRK, founder and director of J. Hobkirk, Sons & Company, Limited, iron and non-ferrous founders, Bedford, celebrated his 80th birthday last month.

MR. J. R. TURNER, personnel manager for the engineering firm of Peter Brotherhood, Limited, Walton, Peterborough, since January, 1946, has left to take up an appointment with the Colonial Office in Nigeria.

MR. VICTOR H. HORSLEY, commercial manager of Charles Carr, Limited, non-ferrous founders, Smethwick, has been appointed to the board of directors. Mr. Horsley is a well-known figure in non-ferrous foundry circles.

MR. F. F. GORDON has been appointed a managing director of Spear & Jackson, Limited, of Sheffield. MR. G. F. HOWARD and MR. G. W. PARSONS, special directors, have been appointed members of the board as technical directors. MR. D. F. GORDON has been appointed a special director.

DR. W. STEVEN is joining the development and research department of the Mond Nickel Company, Limited, on July 1, to take charge of the ferrous research section of their Birmingham laboratory. Dr. Steven obtained his B.Sc. in metallurgy, with first-class honours, at Glasgow, in 1939 and his Ph.D. in 1942. In the same year he joined the staff of William Jessop & Sons, Limited, Sheffield, and during the last few years has held the position of chief metallurgist. As secretary of the Hardenability Sub-committee, he played a prominent part in the preparation of the Hardenability Symposium recently published by the Iron and Steel Institute.

DR. G. E. GARDAM, the newly appointed Director of Research for the Design and Research Centre which has been set up on the recommendation of the Working Party for the gold, silver and jewellery industries, has been for 22 years in the Armaments Research Department of the Ministry of Supply at Woolwich, and has been engaged chiefly as investigator in the electro-deposition section of the Metallurgical Branch, of which section he was in charge. While at Woolwich he did a considerable amount of development work on electro-deposition and corrosion for Service purposes, and industrial work for the British Non-Ferrous Metals Research Association. During the war, Dr. Gardam was at the Metallurgical Branch outstation at University College, Swansea, and was in charge of that station from 1943. He has served on a number of Ministry of Supply and inter-Service technical committees, and in 1945, led the B.I.O.S. team which visited Germany chiefly for electro-deposition research. He has published a number of technical Papers and obtained the degree of Ph.D. for his work in electro-chemical research. He is also a Fellow of the Royal Institute of Chemistry, a Fellow of the Institution of Metallurgists, an Associate of the Royal College of Science and holds the degree of B.Sc. Dr. Gardam has been well known in the Electrodepositors' Technical Society for a number of years; he is now vice-president and president-elect of this Society.

IN our May 22 issue, under the heading "Opportunities in the Foundry," an unfortunate printer's error crept in. The second word of the third paragraph should have been sand mixing—and not blasting as printed.

THE SELECT COMMITTEE ON ESTIMATES, in their second report, state that while the Board of Trade estimates potential employment to be provided by the new factories in the development areas now approved as 149,100, yet on March 31 this year employment for only 3,251 had been provided. Shortages of bricks and steel have seriously delayed the construction of the new factories, but "to overcome the delays an undue reliance seems to have been placed on the appointment of progress officers." The Committee state:—"The need is rather for decisions on a ministerial level to provide that the manufacturers of the basic materials for factory construction and industrial plant are enabled to maintain full production."

PIG-IRON AND STEEL PRODUCTION IN GREAT BRITAIN (*Continued from previous page.*)

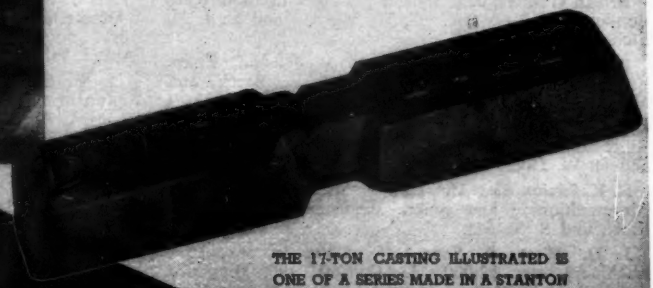
TABLE IV.—*General Summary of Pig-iron and Steel Industry.* (*Weekly Averages in Thousands of Tons.*)

Period.	Iron ore output.	Imported ore consumed.	Output of pig-iron and ferro-alloys.	Scrap used in steel-making.	Steel (incl. alloy.)			Steel stocks held by producers etc.*
					Steel imports.	Output of ingots and castings.	Deliveries of finished steel.	
1938	228.1	89.2	130.0	117.9	16.2	200.0	—	—
1946	234.1	115.4	149.3	147.0	8.3	244.1	191.6	1,189.7
1946—October	230.2	126.3	155.8	153.6	10.8	254.3	209.1	1,103.9
November	221.7	127.3	153.9	160.0	8.7	263.7	208.4	1,068.5
December	216.7	125.7	153.2	143.3	4.9	236.3	185.8	1,045.3
1947—January.. ..	218.0	127.4	150.1	144.5	5.1	239.8	196.0	1,067.5
February	146.4	116.1	126.1	122.7	10.1	206.2	161.2	1,000.5
March	172.1	111.0	123.1	116.7	12.7	196.0	179.2	983.2

* Stocks at the beginning of the years and months shown.

STANTON-DALE
REFINED PIG IRON

Manufactured to guaranteed analyses in seven standard grades. Also obtainable to individual specification



THE 17-TON CASTING ILLUSTRATED IS ONE OF A SERIES MADE IN A STANTON FOUNDRY FROM STANTON DALE IRON

1. Core being lowered into mould
2. Pouring the metal
3. Finished casting in transit

The
STANTON IRONWORKS
COMPANY LIMITED
NEAR NOTTINGHAM

New Companies

("Limited" is understood. Figures indicate capital. Names are of directors unless otherwise stated. Information compiled by Jordan & Sons, 116, Chancery Lane, London, W.C.2.)

Victory Agricultural Machine Company, 3, Albemarle Way, Clerkenwell, London, E.C.—£20,000.

Engine Components, 11, Fountain Street, Bradford—£5,000. G. R. Lawson, J., S., and N. Hemingway.

Cure & Deeley, Guildford Street, Lozells, Birmingham—Engineers, etc. £1,000. R. Cure and F. Deeley.

Grazebrook Foundry, Netherton Iron Works, Dudley, Worcs.—£50,000. O. F. and C. J. Grazebrook.

J. C. Hitt & Sons, Brackla Street, Bridgend—Engineers, etc. £35,000. H. C. Stamp, J. C., J. T., and G. Hitt.

British Gaskets, 529, Salisbury House, London Wall, London, E.C.2—£1,000. C. H. Masters and C. J. N. Etches.

Beech's Engineers (Burslem), Wedgwood Place, Burslem—£2,000. M., S. A. and T. W. Beech, and M. Parton.

Ernest Doe & Sons, Ulting, near Maldon, Essex—Agricultural engineers, etc. £100,000. E. C., A. E., and H. W. Doe.

R. K. Saxton (Sax-Air), Dawson Street, Hyde, Ches.—Air-conditioning and general engineers, etc. £1,000. R. K. and S. Saxton.

J. H. West & Sons—Manufacturers of plant, machinery, etc. £2,000. J. H. West, 190, Highbury Road, Bulwell, Notts.

Decall, 196, High Street, Bromley, Kent—Sand blasters, polishers of steel and metal, etc. £1,000. H. J. and W. A. Sleep.

Pictorial Machinery (Engineers), 32, Highgate High Street, London, N.6—£10,000. E. O. and J. F. L. Corkett, and L. Linzell.

Rowley Plant Hire Company, Abford House, Wilton Road, Victoria, London, S.W.1—£20,000. H. Stephenson and G. Cox.

Birchfield Engineering Company, 52, Aldridge Road, Perry Barr, Birmingham—£3,000. E. E. and J. N. Bunting and J. A. Nelson.

D. B. Sidey, 57, Highcross Street, Leicester—Engineers, etc. £4,000. H. D. Hill, J. Preston, D. B. Sidey, and J. R. E. M. Haylock.

B.D.R.W. Foundry, Snake Hill, Birds Royd Lane, Brighouse. £1,000. G. L. Bain, W. Denton, H. J. Rawnsley and H. Wilson.

Engineering Supplies & Industrial Development Company, 16, Wood Street, Kingston-on-Thames—£1,000. H. G. W. Godfrey.

Brogden & Wilson, Sussex Street, Scarborough—Engineers and ironfounders. £20,000. T. F. Brogden, J. F. Wilson, and W. N. Huss.

Presmould, 154a, Northchurch Road, London, N.1—Manufacturers of moulds, dies, etc. £2,000. G. Maurice, W. T. and A. G. Peirce.

Montrose Foundry, 81, High Street, Montrose—£10,000. Iron and steel founders. A. J. Reid, F. D. M. Ross, J. Hunter, and D. S. Milne.

Bournemouth & Poole Engineering Company, 3, Edith Walk, Malvern, Worcs.—£15,000. H. Southall, J. G. A. Way-Hope, and F. C. Roy.

W. N. Thomas & Sons, Chapel Street (rear of 118, High Street), Slough—Metal and scrap merchants. £5,000. J. R., S. and G. A. Thomas.

Hawk Metalcraft, National Provincial Bank Chambers, Hertford Street, Coventry—£1,000. R. C. Ford, R. C. Newton and J. E. Hawksford.

P. B. Snowdon, 242, High Street, Bromley, Kent—Manufacturers of metallic engine packings, etc. P. B., V. B. and D. Snowdon, and D. Hunt.

Horseshoe Supply Company (Spalding)—Agricultural and general engineers, etc. £15,000. C. E. Frith, Arden Villa, 91, Pennygate, Spalding.

J. P. Steward & Company, 46-54, York Street, Luton—Engineers. £10,000. J. P. Steward, R. Harvey-Jones, C. W. Sadd and L. W. Johnstone.

D.C. Metal Products, 121-5, Fonthill Road, London, N.4—Engineers, tool makers, platers, etc. £6,000. F. W. and A. G. Davis, and E. C. Cribb.

Dalton Engineering Company (Blyth), 10, Simpson Street, Blyth, Northumberland—£6,000. M. E. C. Walton, H. Dyne, M. Metcalf and R. P. Bell.

Home Maintenance, 57, Windsor Road, Slough, Bucks—Heating and ventilating engineers, etc. £1,000. E. L. Rutter, A. P. Burns, and R. H. Young.

H. A. Benson, Godliman House, Godliman Street, London, E.C.4—Marine and general engineers, etc. £3,000. H. A. Benson and V. F. D. Landman.

Universal Products (Birmingham), 32, Ludgate Hill, Birmingham—Manufacturers of machinery, etc. £1,000. W. J. Worthington and F. W. Bodger.

New Patents

The following list of Patent Specifications accepted has been taken from the "Official Journal (Patent)." Printed copies of the full Specifications are obtainable from the Patent Office, 25, Southampton Buildings, London, W.C.2, price 1s. each.

585,881 FORD MOTOR COMPANY, LIMITED. Centrifugal casting.

585,921 BIRMINGHAM ELECTRIC FURNACES, LIMITED, and ROBIETTE, A. G. E. Decarburisation of iron-alloy castings.

585,941 MORTON, L. Travelling grates for furnaces.

585,974 FALLON, J. Method and means of heat-treating articles.

586,612 CARNEGIE-ILLINOIS STEEL CORPORATION. Photo-electric means for the detection of pin-holes in metal strip.

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Raw Material Markets

Iron and Steel

Foundrymen are anxiously canvassing the prospects of re-lighting some of Britain's idle blast furnaces. The make of basic iron seems to be adequate for the limited number of steel furnaces now in operation, but foundrymen cannot maintain their outputs of castings on their present allocations of pig-iron. Everything depends on fuel supplies. With more coal the output of pig-iron could be speedily increased, but the fuel position is still too precarious to justify the operation of more blast furnaces, and in the meantime all grades of pig-iron, with the exception of basic, are in short supply.

Imports of steel semis from the Continent continue to decline, but last month's shipments from the United States and Canada amounted to nearly 38,000 tons and hopes are entertained that still bigger Transatlantic consignments will be obtainable as the year advances. This traffic will mean a heavy drain on our dwindling dollar reserves, but the need is urgent. Re-rollers cannot keep the mills going on home supplies, even though all sorts of defectives and scrap are being used. Prime billets are badly wanted and sheet mills have encroached so heavily upon their stocks that they, too, are now clamouring for more bars and slabs.

Outside the six priority classes, all users of finished steel products are still working on reduced quotas. Even the shipyards are only getting 50 per cent. of their basic requirements, and there is as yet no sign of early improvement. In these circumstances it seems difficult to justify the maintenance of exports at the rate of 150,000 tons a month, and it is suggested that further limitations of exports in the interests of vital home industries would be sound economy. Meanwhile, applications for licences for finished steel products far exceed maximum capacity and in determining the conflicting claims of various industries the authorities have an onerous and unenviable task.

Non-ferrous Metals

It is reported in the United States that the British Ministry of Supply is making inquiries for an appreciable amount of Latin-American copper for delivery in the second half of this year. No tonnage has been specified, but it is estimated that as much as 60,000 tons may be sought. American copper circles are doubtful whether such a large tonnage will be available, however, as commitments made, or in prospect, are expected to take the bulk of Latin-American production, which is estimated at 50,000 tons monthly. Of this total about half is consigned to the United States; approximately 7,000 tons is retained in Latin-American countries, while France, Italy, Sweden and other European countries are also substantial buyers.

The United States output of refined copper during April showed a sharp increase at 107,270 short tons, compared with 88,131 tons for the previous month. At the same time, domestic deliveries fell to 120,311 tons. The world price of copper is still about 23.75 cents per lb., New York for electro, but there is a distinct lessening of the demand in the international market. It is understood that in some instances metal has been offered more or less freely.

At a recent meeting of the American Iron and Steel Institute it was stated that world tin stocks were expected to be down by about 40,000 tons by the beginning of next year. At the same time, a graph produced by the tin, lead and zinc branch of the Civilian Production Administration shows that reserve stocks of tin in the United States are being depleted at a rate which, if it continues, will mean their exhaustion by the middle of 1948. This fact is causing some disquiet in American official circles.

The quota of tin provided by Belgium for Italy under the trade agreement of these two countries amounts to 900 metric tons.

MR. FREDERICK SMITH, whose retirement was reported in our issue of May 22, was incorrectly stated to have been assistant general foundries manager of Markham & Company, Limited, Chesterfield. He held that position with the Staveley Coal & Iron Company, Limited. MR. JOHN CHARLES GREAVES, assistant superintendent in the foundry of Markham & Company, retired at about the same time as Mr. Smith. He had been with the company for 53 years.

EXTENSIVE ALTERATIONS are being carried out at the Southwick Works, Sunderland, of George Clark (1938), Limited. The alterations will facilitate the more economical production of Diesel marine engines of 800 to 2,000 h.p. The changes are being made following an arrangement made recently by George Clark (1938), Limited, the North Eastern Marine Engineering Company (1938), Limited, and Richardsons Westgarth & Company, Limited. The North Eastern Marine Engineering Company are continuing the making of steam engines, while Richardsons Westgarth are concentrating on turbines.

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